UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,787	12/01/2003	Gianluca Paladini	2002P19673 US01	1913

7590 06/09/2009

Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER	
RICHER, AARON M	

ART UNIT	PAPER NUMBER
2628	

MAIL DATE	DELIVERY MODE
06/09/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/724,787	PALADINI, GIANLUCA	
	Examiner	Art Unit	
	AARON M. RICHER	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *10* is/are allowed.

6)☒ Claim(s) *1-9,11-20 and 22-27* is/are rejected.

7)☒ Claim(s) *21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed March 17, 2009 have been fully considered but they are not persuasive.

2. As to the 35 USC 101 rejections of claims 14 and 22, applicant argues that transformation of data representing a patient into an image is statutory and cites *in re Bilski*. However, the claims do nothing more than change formats of data that has already been collected. Interpolation of display values is simply a mathematical operation, not an operation where data is actually transformed into an image. It is further noted that, even assuming that the claims did recite displaying the image values, this would be an insignificant step in the process, since outputting is not a significant enough step to pass the machine-or-transformation test. The significant steps of identification and interpolation are not tied to a machine, and so the methods do not appear tied to a statutory class.

3. As to the 35 USC 103 rejections of the claims, applicant argues that the tables of Halmann would be used by applying each piece of ultrasound data to the tables and converting to a display value. It is noted by examiner that this is a possible (although not expressly disclosed) interpretation of Halmann. However, it is noted by examiner that it is irrelevant which of ultrasound data or display data is actually applied to the table because both methods would read on applicant's claims. Examiner again gives the example of the table from the previous Office Action:

A	B
1	2
2	4
3	6
4	8

If A is known to be 1, and one wants to know B, one identifies the data in column A and looks up the value B. If A is known to be 1.5, one identifies the A data as a function of the other values in column A (i.e. A= (1+2)/2) and then interpolates a value B (B= (2+4)/2). If A corresponds to ultrasound data and B corresponds to display data, then one has identified ultrasound data as a function of the table values and interpolated display data from the identified ultrasound data. It is noted that Halmann does clearly disclose interpolation with respect to the lookup table, and so such a conclusion is not based on impermissible hindsight.

Applicant further argues that Halmann does not operate scan conversion as a function of volume rendering, but examiner has not relied on Halmann for this, instead citing Seiler. Applicant argues, with respect to Seiler, that this reference does not avoid scan conversion because volume sections in Seiler are reviewed to avoid unnecessary 3D rendering of 3D voxels. Examiner agrees that Seiler does not discuss scan conversion, but also notes that the concept of skipping unviewable sections of a volume is applicable to both ray tracing and scan conversion, and so it appears that one skilled in the art would not limit oneself to other scan conversion references when trying to

improve a scan conversion process. Applicant argues that the voxel transfer avoidance of Seiler would not enabled if combined with Halmann, but examiner notes that MPEP 2145 states that:

> ""The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference.... Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). See also In re Sneed, 710 F.2d 1544, 1550, 218 USPQ 385, 389 (Fed. Cir. 1983) ("[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review."); and In re Nievelt, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973) ("Combining the teachings of references does not involve an ability to combine their specific structures."). However, the claimed combination cannot change the principle of operation of the primary reference or render the reference inoperable for its intended purpose.

In the instant case, it is the combined teachings that are relevant. Examiner notes that bringing the extra rendering avoidance techniques of Seiler into Halmann would not destroy or change the principle of Halmann, just improve its efficiency.

4. As to claims 3 and 16, applicant argues that the area of interest is not used to identify acquired data in Halmann because identifying all ultrasound data is not the same as using the area to identify data. However, in the case proposed by Halmann, it appears that all of the acquired ultrasound data acquired in this step may correspond to the area of interest. Examiner notes that the polar data values collected in this step correspond to an image frame of an area of interest (col. 8, lines 1-3), and so the display coordinates of interest may correspond to an entire frame.

5. As to claims 5, 18, and 26, applicant argues that rendering can account for any coordinate system, meaning that examiner's assertion that there is no way to render an image if the original coordinates are polar is untrue. Examiner notes that, assuming the display is a typical display divided into lines and columns, some sort of scan conversion into Cartesian coordinates must take place, since to drive the display correctly, one will

have to obtain the row and column numbers of the pixels. Examiner notes that Halmann discloses lookup tables as the method for scan conversion and one skilled in the art would therefore reasonably conclude the tables would be used with the raycasting module. Applicant further argues that rendering may provide data for each pixel based on ray casting, but examiner notes that one would still need to convert the data, and absent any other way of doing that, it would appear the scan conversion tables would be necessary.

6. As to claim 11, applicant argues that the nature of the scan conversion process is such that GPUs are not used. This is not correct and many examples of a GPU executing scan conversion exist. For instance, see col. 1, lines 21-35 of U.S. Patent 6,956,579, which goes as far as to state that the "typical" GPU performs graphics computations such as scan conversion.

7. As to claim 2, applicant argues that Halmann does not disclose coordinate values in the lookup table, and further does not disclose Polar coordinates indexed by Cartesian coordinates. However, col. 7, lines 50-58 of Halmann explicitly state that the tables convert between Polar and Cartesian coordinates. If the lookup tables do not contain coordinate values indexed to each other, it is not clear how else the coordinates would be converted.

8. As to claim 4, applicant argues that Hossack does not use plane coordinates as an input to the lookup table and that Halmann treats volume rendering separately from scan conversion. However, examiner points out that the LUT is Halmann's method of performing scan conversion, and as pointed out above, some sort of conversion must

be done to obtain display data. Applicant further argues that the form of conversion would be Halmann's and not a reverse conversion that intermixes separate rendering processes. Examiner notes that Hossack also discloses a polar to Cartesian lookup table for scan conversion (col. 5, line 62-col. 6, line 1) and so it appears that the rendering processes are compatible.

9. As to claims 6 and 19, applicant argues that Okerlund is not compatible with Halmann because Halmann uses CPU rendering, while Okerlund uses hardware rendering. Examiner notes that the methods are not so different as to be incompatible. Techniques that are not hardware-specific can be used with both a CPU and a GPU, and so it appears that the two references are compatible. Applicant further states that compatibility is not the test, but rather the test is if one skilled in the art would have used the specialized hardware approach of Okerlund with the versatile CPU approach of Halmann. However, examiner's point about non-specific methods still stands. RGBA methods can be used with CPUs or GPUs, and one skilled in the art, upon seeing the Okerlund reference, would not limit oneself to the specific hardware method of Okerlund. Rather, one would recognize that the teaching had general applicability in the art.

10. As to claim 12, applicant argues that a person skilled in the art would not have picked a flag and integer sum as mere design choices since there is no reason for them in Halmann. Examiner agrees that there is no reason to use them in Halmann, but notes that there is no reason to not use them in Halmann either, and that there is also no reason to use them in the context of the claimed invention, hence why they are a

design choice. Applicant further argues that an integer sum allows indication of spatial relationship as noted in the specification. Examiner notes that this is not relevant to the claimed invention since the claimed invention does not recite indication of a spatial relationship, and further notes that there is still no criticality for using an "integer sum" as the variable here. Other variables would appear to work equally as well for the purpose of indicating a spatial relationship.

Claim Rejections - 35 USC § 112

11. Claims 1-9 and 11-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claims now recite that a lookup table converts from a two-dimensional display format to a two-dimensional acquisition format. However, examiner notes that the claims and specification are directed to volume rendering which means that the acquisition format is a 3D data volume, and therefore not a "two-dimensional acquisition format".

12. Claims 1-9 and 11-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claims recite a "two-dimensional acquisition format" and also recite avoiding scan conversion of volume data that does not contribute to a final volume

rendered image. If volume data is being converted, then the acquisition format must be three-dimensional, and therefore, the claim contradicts itself and is not enabled.

Claim Rejections - 35 USC § 101

13. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

14. Claims 14-20 and 22-27 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 14-20 and 22-27 are directed to a method that does not pass the machine-or-transformation test and are therefore non-statutory

Recently, the Court of Appeals for the Federal Circuit issued an opinion affirming a final decision by the Board of Patent Appeals and Interferences sustaining a rejection of claims because they were not directed to patent-eligible subject matter under 35 U.S.C. 101. See In re *Bilski,* 545 F.3d *943,* 88 USPQ2d 1385 (Fed. Cir. 2008). The court's opinion clarified the standards applicable in determining whether a claimed method constitutes a statutory "process" under 35 USC 101.

As clarified in Bilski, the test for a method claim is whether the claimed method is (1) tied to a particular machine or apparatus, or (2) transforms a particular article to a different state or thing. There are two corollaries to the machine-or-transformation test. First, a mere field-of-use limitation is generally insufficient to render an otherwise ineligible method claim patent eligible. This means the machine or transformation must impose meaningful limits on the method claim's scope to pass the test. Second, insignificant extra-solution activity will not transform an unpatentable principle into a

patentable process. This means reciting a specific machine or a particular transformation of a specific article in an insignificant step, such as data gathering or outputting, is not sufficient to pass the test. In the instant case, there is no machine claimed that is actually identifying or transforming data. All of the steps of the claims could be done manually- a person could create a lookup table between a display and an acquisition format and then interpolate to find display values.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claims 1, 3, 5, 11-14, 16, 18, and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann (U.S. Patent 6,526,163) in view of Seiler (EP 1,093,085).

17. As to claim 1, as best understood, Halmann discloses a system for scan converting ultrasound data from an acquisition format to a display format, the system comprising:

a look-up table having values corresponding to a spatial conversion from the display format to the acquisition format (col. 7, lines 54-57; a number of scan conversion tables are generated);

and a processor operable to identify acquired ultrasound data as a function of the values and operable to interpolate display values from the identified acquired ultrasound data (col. 8, line 52-col. 9, line 4).

Halmann does not disclose that the processor is operable to avoid scan conversion of volume data that does not contribute to a final volume rendered image, the identifying corresponding to identifying for display format coordinates associated with visible voxels of the final volume rendered image. Seiler, however, discloses voxel visibility tests performed for each voxel, so that only the visible voxels are rendered (see abstract, fig. 9, and col. 13-14, sections 0076-0082; also see col. 10-13 for the specifics of how visibility tests are performed), meaning that only the viewable voxels get actual display coordinates. The motivation for this is to reduce time needed to render a volume (col. 12, section 0066). It would have been obvious to one skilled in the art to modify Halmann to only scan convert visible voxels in order to save time as taught by Seiler.

18. As to claim 3, Halmann discloses a system wherein the processor is operable to determine display coordinates of interest (col. 8, lines 4-9; an area of interest is defined and polar coordinates are defined from this area) and identify the acquired ultrasound data by inputting the display coordinates of interest into the look-up table (col. 7, lines col. 7, lines 54-57; col. 8, line 52-col. 9, line 4; the process of scan conversion finds ultrasound data coordinates for display coordinates by converting from polar to Cartesian).

19. As to claim 5, Halmann discloses a system wherein the acquired ultrasound data represents a volume in the acquisition format, wherein the processor is operable to determine display coordinates for a plurality of rays through the volume as the display coordinates of interest (col. 5, lines 35-40; a volume rendering/raycasting module produces an image for display, which must include determination of display coordinates);

further comprising a display operable to display a two-dimensional image of a Volume Rendering of at least a portion of the volume in the display format with the display values (fig. 1, element 16; col. 5, lines 35-40).

20. As to claim 11, Halmann discloses a system wherein the processor comprises a central processing unit (col. 8, line 52-col. 9, line 4; Halmann discloses a number of CPUs set up for scan conversion). Official notice has been taken of the fact that performing graphics operations in a GPU is well-known in the art (see MPEP 2144.03). It would have been obvious to one skilled in the art to modify Halmann to perform scan conversion in a separate GPU in order to more quickly process data.

21. As to claim 12, Halmann does not disclose a system wherein the look-up table values each comprise a set of two fixed-point values, one Boolean Flag, and one Integer Sum, the two fixed-point values being Polar coordinates. These, however, are all arbitrary classes of variables and there is no disclosed criticality to them in applicant's specification. The choosing of these particular classes of variables appears to be a matter of design choice. One skilled in the art would expect the inventions of

Halmann and Seiler to work equally well with various other types of variables, such as integers, floating point variables, etc.

22. As to claim 13, Halmann does not expressly disclose a system wherein a Boolean Flag indicates whether the set corresponds to a location outside of a scanned region. However, Official Notice has been taken of the fact that setting a variable for when data is in or out of a range is well-known in the art (see MPEP 2144.03). It would have been obvious to one skilled in the art to modify Halmann and Seiler to set a variable when data is out of range in order to communicate this error to other parts of a computing system.

23. As to claim 14, Halmann discloses a method for scan conversion of ultrasound data from an acquisition format to a display format, the method comprising:

(a) identifying acquisition format coordinates with display format coordinates indexed to a look-up table (col. 8, lines 3-9; col. 7, lines 54-57; polar coordinates are acquired and changed to display, or Cartesian, coordinates via a lookup table);

(b) interpolating acquisition format coordinates stored in the look-up table (col. 7, lines 54-57; col. 8, line 52-col. 9, line 4);

and (c) interpolating display values from acquired ultrasound data based on the acquisition format coordinates determined in (b) (col. 7, lines 54-57; col. 8, line 52-col. 9, line 4; interpolation takes place to map the acquisition, or polar coordinates, to display, or Cartesian coordinates).

24. As to claim 16, see the rejection to claim 3.

25. As to claim 18, see the rejection to claim 5.

26. As to claim 24, Halmann discloses generating the look-up table as a function of a spatial relationship of a display format with user configured acquisition parameters (col. 7, lines 54-59; tables generated are dependent on a selected mode of operation; col. 3, lines 59-62 states that this mode is determined by a user and col. 5, line 51-58 states that the mode determines acquisition parameters).

27. As to claim 25, see the rejection to claim 13.

28. As to claim 26, Halmann discloses a system wherein (d) comprises generating a two-dimensional look-up table with acquisition format coordinates for each coordinate of a Cartesian volume (col. 7, lines 54-57; col. 8, line 52-col. 9, line 4; a lookup table for Cartesian coordinates would have to use at least x and y coordinates, inherently making it a 2-dimensional lookup table).

29. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann in view of Seiler and Zar ("A Scan Conversion Engine for Standard B-Mode Ultrasonic Imaging").

30. As to claim 2, Halmann discloses values comprising polar coordinates and lookup table entries indexed by Cartesian coordinates (col. 7, lines 54-57; col. 7, lines 54-57), but does not expressly disclose a processor operable to bilinearly interpolate from the look-up table values using fractional offsets of Cartesian coordinates. Zar, however, discloses a bilinear interpolation using fraction offsets of Cartesian coordinates (p. 1, Introduction) to be able to convert to polar using a lookup table (p. 2, LUTs and Constant LUTs sections). The motivation for using this system is to accomplish scan conversion at a very low cost (p. 1, Abstract). It would have been

obvious to one skilled in the art to use bilinear interpolation and LUTs to convert polar to Cartesian coordinates in order to reduce cost as taught by Zar.

31. Claims 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann in view of Seiler and Hossack (U.S. Patent 6,352,511).

32. As to claim 4, Halmann discloses a system wherein the acquired ultrasound data represents a volume in the acquisition format (col. 5, lines 35-40) and also a system comprising a display operable to display a two-dimensional image representing the plane in the display format with the display values (fig. 1, element 16). Halmann does not disclose a system wherein the processor is operable to determine display coordinates for a plane through the volume as the display coordinates of interest. Hossack, however, discloses a system that allows for display of an arbitrary 2-dimensional plane through a 3-dimensional volume (col. 17, lines 4-11). The motivation for this is to allow the ultrasound image to better act as a diagnostic aid (col. 16, lines 50-57). It would have been obvious to one skilled in the art to modify Halmann and Seiler to determine display coordinates for a plane through a volume in order to better diagnose a patient as taught by Hossack.

33. As to claim 17, see the rejection to claim 14. Hossack further discloses displaying a two-dimensional MPR image representing the plane in the display format as a function of the display values (col. 17, lines 4-11).

34. Claims 6 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann in view of Seiler and Okerlund (U.S. Patent 6,690,371)

35. As to claim 6, Halmann does not disclose a system wherein each of the display values is a function of an alpha blending of a plurality of acquired ultrasound data values and wherein the processor is operable to limit a number of acquired ultrasound data values blended as a function of a threshold such that scan conversion of other acquired ultrasound data values is avoided. Okerlund, however, discloses alpha blending ultrasound data values (col. 7, lines 4-19; RGBA values are used to blend), and limiting the number of values blended to a "decimated" volume (fig, 13; col. 11, lines 8-35) with a threshold of less than a full volume. The motivation for this is to more rapidly render an image volume (col. 11, lines 8-10). It would have been obvious to one skilled in the art to modify Halmann and Seiler to use a threshold to ensure only some ultrasound data is blended in order to reduce time taken to display as taught by Okerlund.

36. As to claim 19, see the rejection to claim 6.

37. Claims 7 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann in view of Seiler and Drebin (U.S. Patent 4,835,712).

38. As to claim 7, Halmann does not disclose a system comprising an RGBA look-up table addressed by the display values, the RGBA look-up table operable to output an RGBA value corresponding to the display value. Drebin, however, discloses a system that inputs monochrome display values to a lookup table and outputs RGBA values for those values (col. 7, lines 44-62). The motivation for this is to simulate an image illuminated by one or more sources of light (col. 2, lines 4-24). It would have been obvious to one skilled in the art to modify Halmann and Seiler to use a lookup table to

convert between display values and RGBA values in order to simulate an image illuminated by one or more sources of light as taught by Drebin.

39. As to claim 20, see the rejection to claim 7.

40. Claims 9 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann in view of Seiler and Swerdloff (U.S. Patent 5,483,567).

41. As to claim 9, Halmann does not disclose a system wherein the look-up table values correspond to the spatial conversion from the display format to the acquisition format for at least one acquisition plane; further comprising an additional look-up table corresponding to spatial conversion from the display format to the acquisition format across multiple acquisition planes. Swerdloff, however, discloses a system wherein a change in relationship between polar and Cartesian voxels, such as a change when changing an acquisition plane, necessitates creation of another lookup table (col. 9, lines 6-25). This is motivated by the fact that the current lookup table will no longer be accurate (col. 9, lines 19-25). It would have been obvious to one skilled in the art to modify Halmann and Seiler to use an additional lookup table when multiple acquisition planes are used in order to have an accurate lookup table as taught by Swerdloff.

42. As to claim 22, see the rejection to claim 9.

43. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann in view of Seiler and Fattah (U.S. Patent 7,274,325)

44. As to claim 15, Halmann discloses a method wherein (a) comprises: (a1) inputting coordinates into the look-up table; and (a2) outputting coordinates interpolated from the look-up table in response to (a1) (col. 7, lines 54-57; col. 8, line 52-col. 9, line

4; the process of scan conversion involves a polar to Cartesian conversion via lookup table and interpolation). It is noted that Halmann does not explicitly teach inputting Cartesian coordinates and outputting Polar coordinates, instead performing data conversion the other way. However, it is also noted that the Cartesian-Polar lookup table is known in the art as shown by Fattah (fig. 7b; col. 11, lines 2-41). The motivation for using this method is to allow greater efficiency and enable a software based system to work in real time. It would have been obvious to one skilled in the art to modify Halmann and Seiler to lookup Cartesian coordinates and output Polar coordinates in order to allow greater efficiency as taught by Fattah.

45. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halmann in view of Seiler and Edic (U.S. Publication 2004/0136490).

46. As to claim 27, Halmann does not disclose a method further comprising: (d) Volume Rendering as a function of the display values as a function of time. Edic, however, discloses a method of volume rendering in which the motion of a volume over time is depicted (p. 4-5, section 0045). The motivation for this is to represent a cycle, such as a cardiac cycle (p. 4-5, section 0045). It would have been obvious to one skilled in the art to modify Halmann and Seiler to volume render using display values as a function of time in order to represent a cardiac cycle as taught by Edic.

Conclusion

47. Claim 10 is allowed.

48. Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

49. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AARON M. RICHER whose telephone number is (571)272-7790. The examiner can normally be reached on weekdays from 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kee Tung can be reached on (571) 272-7794. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Aaron M Richer/
Examiner, Art Unit 2628
6/7/09